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A Premium Incentive Wage Plan

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NATIONAL ASSOCIATION OF
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APRIL 1, 1922

A PREMIUM INCENTIVE WAGE PLAN*

Variations In Units

In order to understand how this premium plan works in practice it might be desirable to explain the character of the product made by the firm under consideration and the objects sought by the installation of the system.[1] The firm specializes in the manufacture of set up paper boxes of small sizes. While it makes some stock boxes, the larger portion of its product is custom work, i.e., the boxes are made specially for some one customer. Consequently, nearly every order is different.

The variation in product made it difficult to establish any accurate measure of the efficiency of any operation. Furthermore, the varying sizes and styles of the units produced caused any average output per hour to be of little or no value, and as a result it was the feeling that if some reasonably accurate unit of measurement were used, it would be of material assistance in keeping operations up to a high standard of performance.

Constant Piece Rates

Before the adoption of the plan which will be discussed later, the piece rate method of wage payment was used for about 60% of all direct or productive labor. The rates were set on a basis of thousand parts produced. With a shifting labor market the piece rates had to be adjusted up or down almost continually, so that it was difficult to use them as a basis for estimating new work. Each rate had to be scrutinized carefully to see when it was set and whether it could be used again when conditions changed. It was thought that if rates could be based upon the element of time instead of money that they would remain constant as long as the operation remained the same and in figuring new work, therefore, the rates could be used at any time by simply stating the time units in terms of current money values.

Daily Records

Although a large part of the work was piecework, it was felt that it did not supply the proper incentive necessary for the attainment of the best results. Furthermore, the need of being able to

*This article is based upon a paper read by J. H. Paterson of the F. N. Burt Company, Ltd., before the Buffalo Chapter dealing with the operation of the Bedaux Point System in the Burt Plant.[1]

[1]The association has issued another article on an incentive plan. This was Vol III, No. 5, Securing Effective Work from Labor, by J. L. McVicker.

accurately measure each operator's work against a predetermined standard was recognized as important. By use of the system to be described a daily record of the operator's performance is placed in his hands. At the same time an effort to create a direct incentive in the minds of the foremen and indirect labor to lend every possible assistance to the direct labor is made so as to cause actual performances to equal or exceed the standards of performance.

No Uniform Rates

The old piece rates had been set somewhat by rule of thumb. Some had been carefully figured by the factory superintendents and were fairly accurate. Other rates were more or less accurate guesses based upon a general knowledge of past experience, and in some cases there was a tendency to set the rates according to what had been estimated on the job. The result was that rates were not uniform. Therefore, it frequently happened that in shifting an operator from one job to another the operator was dissatisfied. It was felt that conditions could be largely overcome by setting all rates according to a definite uniform procedure based upon accurate time studies of the operations.

Product Reduced to Common Time Units

Lastly, it was felt that if we could reduce our varying product to a common time unit it would be possible by establishing a budget in each department to arrive at a minimum non-productive cost per unit and to create a direct incentive in the minds of the foremen and their assistants to help the direct labor attain this goal. Holding these principle objects in mind let us see how they worked out.

Calculations in Points

All calculations in the system are made upon the basis of the productive point as a unit and it is necessary therefore to have a clear understanding at the outset as to just what a point is. A *point* represents that quantity of a given operation which should be produced in *one minute*, due allowance having been made for unavoidable rest and delays in the calculation of a point. For example, suppose that you have determined by your time study that an operator should produce 540 operations on a certain part in a 9 hour day. As there are 540 minutes in the day, each part represents one point. If a time study shows that 5,400 operations should be produced in 9 hours, then 10 parts would represent one point.

Standards

It is also necessary to an understanding of our wage plan to keep in mind the writer's conception of a standard. A *standard* is the number of minutes or fraction of a minute allowed to produce each piece in a given operation. For example, in the case above

the standard for 540 pieces would be 1, or for the 5,400 pieces, 1. In other words we have allowed one minute for each piece in the first instance and 1/10 of a minute for each piece in the second.

Time Study

Assume you are ready to put the wage plan in operation in a given department. A time study man is selected. His task is to set a standard on every operation which is to be performed in that department. His first step is to code the operator.

He analyzes the necessary motions of the operator, taking the time of each, and makes a note of the false motions used and the time wasted on them, and any other lost time that there may be. From this study the operators are classified as very good, good, fair or poor.

Classifying Operations and Setting Standards

The next step is to classify the operations. Some operations cause more fatigue than others. For example, an operation might be dependent for speed almost entirely upon the speed of the machine, the operator's task being merely to watch the machine and keep it supplied with material. Such an operation would not be rated as high as one which required continuous fast work. This classification of the work is done by the supervising engineer and involves too much detail to attempt an explanation in this article. From these calculations the proper allowance for rest and delay is calculated. The actual time on the job is then taken, the allowance is added and the standard per piece is set, this standard being stated in time required and not in money. This process is repeated until a standard has been set on all operations to be done in the department.

Uniform Rates

At this stage in our work, it is apparent that we have secured one of the objects of our system, namely the setting of all rates by the same procedure. The relative speed of the operators is gauged not by the standard of past experiences but by an accurate time study of the lost time involved, classified and calculated by a definite formula. By eliminating all lost time from the calculations, we reduce the operation to the actual necessary time required and then add to this a definite allowance for rest and delay. The factor of the difference in skill of the operators is therefore neutralized and the resultant standards are uniform in that one standard will require the same amount of energy to attain as another.

Premium

One more point in regard to the setting of standards should be noted before we proceed to the next step. It is the intention that an incentive be given to the operator to attain speed. This is done by paying a premium for production over the standard as will

be explained in detail later. It is evident that if a standard is set so high that only an exceptional operator can make it, or at best only slightly exceed it with very hard work, the incentive will not be great enough to induce the average worker to make the effort. The allowance for rest and delay is large enough, therefore, so that the average operator with a fair amount of diligence can reach the standard and it is quite possible for a really proficient worker to exceed the standard or to make 80 or 90 points an hour instead of the standard of 60 required.

Hour Rates

When the standards have all been set in a department, the next step is to give each operator an hour rate. Since most of the work in our factories is done by girls, the rates used for illustration are the rates in effect for this class of labor. It should be borne in mind, however, that the rate used should be the amount you are willing to pay for an average good operator since the standards are set upon this basis and the exceptionally good worker will make more by premium earnings. As a rule all rates on the same operation should be the same, although there have been some instances in our plant, where on account of exceptionally fine work or as a recognition for long service, we have given an operator a higher rate than other operators on the same work.

Time Sheet

At the end of the first day's work, the checker (time-keeper) in the department makes out a time sheet for each operator in the department. A sample form of this sheet is shown on page 13. At the top of the sheet is the operator's name and his clock number, and at the left the hour rate. In the body of the sheet is entered all the work done during the day. The information entered from left to right is as follows, order No., operation No., class of work (productive or non-productive)[1], name of customer and description of work, hours used (in hours and tenths) and the number of pieces produced. These sheets are then sent to the pay roll department where the time standard, as set by the timestudy man is entered, and the number of points produced is calculated by multiplying the pieces by the standard. The number of points produced is then totaled. Since a point is that quantity of work which should be done in a minute, an operator should produce points equal to 60 times the

[1] The code used in the class column on the time sheet is for the purpose of analyzing the pay roll in the productive and non-productive groups. This code is as follows: 1. Productive labor on which a standard has been set, 2. Productive labor on which no standard has been set, (usually small operations too minute to standardize. Note these two are shown separately on the pay roll summary on lines 4 and 5.) and 3. Non-productive work. These three jobs in question are all productive and standardized, therefore, all Class 1. Due to the varying size and style of units there is a variation in speed of production, and therefore a calculation of the number produced per hour would not be a correct measure of the efficiency of the work done.

number of hours worked. For instance, if the working day is 9 hours, a worker should produce 540 points. This quantity is then deducted from the total points and the balance is the premium points produced. In order to understand this calculation refer to Form 1. In this case operator No. 540 whose rate was .24 per hour worked on three different orders, doing the same operation on each. The boxes were of different size and style, however, and therefore the time required was different for each order. On the first order 1/10 of a minute (as a standard) was allowed for each piece, on the second 85/1000, and on the third 11/100 of a minute. The number of points produced is figured by multiplying each standard by the number of pieces as for instance 2500 x .1=250. The total points produced is seen to be 603. This operator worked a total of 9 hours and should therefore produce 60 x 9 or 540 points, thus having a balance or a premium of 63 points over the standard number of points.

Calculation of Pay

The operator's pay is then calculated as follows: The hour rate, or the day work rate per hour, (.24) times the number of hours worked (9 hours)=$2.16. To this is added 75% of the value of premium points. As an hour is equal to 60 points the value of a point is 1/60 of the hour rate or in this case .004. 75% of .004 is .003 so that the premium earned is 63 x .003=.19 and the total pay earned is $2.16+.19=$2.35.

Units of Measure and Rates in Time

From the above description it is apparent that we have now secured two more of our objectives, namely, units of measure and rates in time rather than in money. The illustration is that of an operator who works on three different orders but on the same operation on each. Due to the variation of product the time required per piece or per M pieces varies about 30% from the fastest to the slowest work. The average output per hour in the illustration above was 678. This figure, however, shows you nothing in regard to the efficiency of the work done since it would show very slow time for the last order on the sheet but very fast time for the second order. Without an analysis of each order you cannot tell whether the work was fast or slow. By giving to each order, however, a definite time allowance based upon an accurate time study you know at once that this work was done at 67 points an hour or about 10% faster than the standard. By tabulating the hours and points on any operation you have at once a measure of efficiency against a predetermined standard.

The second objective is accomplished because you have set your rates in time instead of money and can use them for estimating future work as long as the process remains the same. For example, if you had a piece rate set at .40 per M on the first order, you could not use it again if your labor market went either up or

down, but with your standard of .1, if you get the same operation to do again a year from now you use it, giving it the prevailing value. If your day rate at that time was .27 per hour instead of .24, your cost would be .45 instead of .40, or if it was .21 instead of .24 your cost would be .35.[1] By keeping a card file of all standards set, properly classified, you soon have all the information necessary to make sliding scales for your estimating department, covering the complete range of work done.

Posting Sheets

Although it is of great value to be able to measure each operator's work against a standard this result in itself is not enough for effective labor control. The operator himself and his foreman must know exactly and quickly just what actual performances are. In order to accomplish this result, the daily time sheets are posted each day to a posting sheet (See Form 2, Page 13). This sheet is made out by the pay roll department at the beginning of each week. As soon as the first day's time is figured, the information is entered on the sheet showing total points produced, hours worked, point hour and amount of premium carried.[2] The time of all employees whose point hour is below 60 are posted in red. The posting sheet is then sent to the department where the work was done and placed on a board. It arrives in the department at 4 o'clock on the day following that on which the work was done. The sheet remains on the board until the next day's time is ready when it is brought back to the pay roll department where the day's work is put on. Then it is placed on the board again.

Each operator, therefore, knows exactly what he is doing, how much premium he is earning and when he falls below the standard performance. By watching the red ink figures on this sheet the foremen at once has his attention called to the weak spots in his

[1] If the hour rate is .24, the value of a point is one-sixtieth of the rate, or .004; if the hour rate is .21, the value of a point is one-sixtieth of 21, or .0035; and if the hour rate is .27, the value of a point is one-sixtieth of 27, or .0045. The standard set on the job in question was .1 per piece, or 100 points per thousand pieces. In other words, the operator would make 100 points for every 1,000 pieces produced. As your day rate shown on the time sheet was .24, the cost per thousand is therefore 100 x .004, or .40. If you do the same work on a .21 rate the cost per thousand would be 100 x .0035, or .35; or, at a .27 rate, the cost would be 100 x .0045, or .45.

[2] The posting sheets are figured as follows: The total points are divided by the hours worked to get the point hour average. The premium is figured by subtracting the standard points from the total points produced, and multiplying the remainder by 75% of the value of a point. The following example will make this clear:

Total points produced	603
Standard points ((60 x 9 hours)	540
Premium Points	63
Value of a point .004. 75%=.003	.003
Premium earned	.189=.19

department and he can take the necessary steps to correct the trouble. The factory superintendent also gets a list every day of all employees who have fallen below the standard performance. The moral effect of this work is very great.

Pool as an Incentive

There still remains one result to accomplish. The results obtained in a department are largely governed by the quantity and kind of assistance that the operators are given by the foremen, job setters, and stock boys in the department. There must be a direct incentive for these employees to assist the direct labor as much as possible. The reader's attention is again called to the daily time sheet. It will be noted that in figuring the amount of premium earned by the operator, the premium points were figured at only 75% of the value of a point, although in figuring the cost in the last column the total points were figured at the full value. The other 25% of the premium points is set aside in a pool to provide additional compensation for foremen, job setters, and stock boys. Whenever an operator falls below the standard performance, he is paid his day rate. This means that the cost has been higher than the standard set by just the value of the points he failed to produce. For instance, if the total points on the time sheet had been 503 instead of 603 the excess cost would have been 37 points times .004 or $0.15. This excess cost is charged against this pool. Note, therefore, that there is a double incentive given to the foreman and assistants, first that his operators have a high point hour since 25% of all premium goes to his pool, and second to eliminate below standard performances of worker (shown in red ink figures) since not only do such workers fail to earn a premium for the foremen, but the loss is actually charged to his account. The method of distributing this pool will be explained later.

By placing the posting sheet daily in the hands of the operators, they are not only provided with a record of their work measured against a standard but by establishing the pool, the incentive for those who assist the operators is created.

Pay Roll Summary

At the end of the week a complete summary of the payroll is made for each department. See Form 3, on page 14. This summary is a tabulation of the total number of productive points produced, and the total money spent for productive work. The number of productive hours is then tabulated and the average point hour is figured. This point hour figure shows accurately the speed of the department. If it is 60 or above the department is running up to standard. Below the "productive" section of the Pay Roll Summary is shown in points and money the time spent on non-productive work, classified by operations. The information listed in the allowed points section of the Pay Roll Summary represents work done by productive operators on the various non-productive

operations and the information listed in the non-productive section of the Summary is the pay roll of the regular non-productive staff. In the upper right hand corner the actual labor cost per point is calculated. The third column on the Summary is the budget for the department. At the top of the form the normal capacity of the department in points is shown and the budget of non-productive labor allowed to produce this amount of work classified by operations is recorded in the "Normal" column. At the bottom of the column the minimum non-productive cost per point is entered.[1] This budget is figured so as to represent a perfect performance. Note that no time is allowed for operations which should not occur, such as waiting for stock, repairing bad work, etc. At the extreme right the percentage that the actual work done bears to the capacity is shown. By comparing the actual cost per point at the top of the page with the minimum at the bottom of column three (the normal column) you can tell at once how near you have approached to standard, and by applying the percentage of capacity to the amounts allowed for each operation, you can tell exactly where your cost is excessive and by how much. Your percentage figure also gives you the exact amount of work being done in a department in relation to its capacity.[2]

Minimum Cost per Point

These budgets also provide the last objective sought by the use of the premium system, that is, they set up a minimum unit labor cost. When the actual cost rises above this minimum, the pool is penalized by the same percentage as the increase in cost. The foremen is therefore directly interested not only in the speed of the department but also in the cost of the product.

Distributing the Pool

The distribution of the pool created as described above is of great importance. To discuss in detail the exact procedure used would be of little interest to the reader, since it is a matter peculiar to the business under consideration. The procedure of handling this pool would vary according to local conditions. However, the various factors that make up the pool will be mentioned in order to

[1] The minimum non-productive cost at the bottom of column 3 on the pay roll summary is figured by dividing the total budget (in this case $13.00 plus $355.00, or a total of $368.00) by the normal point capacity of 226,863 points, giving a cost of .00162 per point. The actual non-productive cost at the top of the sheet is .00190, or an increase of .00028 per point, or 17%.

[2] There is one point on this summary sheet which might appear as an error, although it is in fact correct, and that is that the total in the amount column under allowed points and non-productive, is $220.33, whereas in the upper right hand corner the total non-productive pay roll is shown as only $219.88. The difference is due to the fact that the .45 under operation No. 1 is the excess cost due to operators being below standard and is charged to the pool. As the total cost of this pool has been included in the productive cost above the line, this does not constitute an additional expense to the firm, and therefore is not included in the non-productive figures.

make clear the incentives it provides. First, the pool consists of 25% of the premiums earned by productive operators, therefore, in order to get a large pool, speed is the first requisite. Second, as the excess cost of the operators below standard is charged to the pool, it is necessary in order to get a large bonus to eliminate the operators who fall below standard. Third, the pool is penalized for high cost so that the speed must be attained without sacrificing the cost of the product. When the amount of the pool is determined by these three factors, it is split according to schedule and paid to the employees participating, payments being made each month. In making the payments it is our custom to accompany it with a memo showing just why the penalties, if any, were imposed.

Results of System

The wage plan described in this article is not a cost system. It concerns itself purely with the matter of applying incentives to increase production and its purpose ends at this point. The results obtained by its use will now be mentioned. We have found that the greatest saving in direct labor has been obtained on those operations that were formerly paid on a day rate basis. On some of these operations the saving has been as high as 30%, in fact, on one operation done in large quantities, the labor cost was cut from 10 to .045 per thousand. On the other hand there were quite a few operations where the old piece rate was found to be low and where the cost has been raised. The average saving in our four plants has been slightly in excess of 10%.

In the speed of the work done the results have been much more marked, particularly in those departments where speed is dependent largely upon the skill of the operator. We have one department whose point hour average at the time of starting was 58. At the present time it is 81, and increase of nearly 40%. We find the average increase in departments of this type to be 18% in automatic or semi-automatic departments where the speed of the machine is the controlling factor, and the skill of the operator does not play so important a part, the in crease has been from 8 to 12%. Unfortunately, during the entire period that this plan has been in operation the output of the factories has been very much curtailed due to the prevailing depression so that this increase in speed has not had the effect on burden cost that it would have produced had the factory been operating normally. It can easily be seen, however, that it will be possible to effect a tremendous saving with the return of normal conditions.

Costing the Product

It may be of interest to discuss how the wage plan described in this article is used in connection with the costing of the product. The productive point is used as the cost unit. Each department is divided into production centers or groups, each group consisting of all machines of like or similar kind. Each group is given an

operation number, and all time spent on these machines is then turned in under these numbers. (See column 2 of Form 1.) By the use of a tabulating machine all the time of these divisions is tabulated in points and money and a productive cost per point on each center is calculated, and at the same time all non-productive labor is analyzed in the proper accounts. At the end of a cost period (4 weeks) we distribute burden charges by the usual procedure to these same production centers and calculate an actual burden cost per point, that is to say, by dividing the total burden by the actual points produced. At the same time we divide the burden charges into two groups, those that are fixed in amount and those that vary according to the amount of product produced. By dividing the first group by the normal capacity points and the other by the actual points produced, and adding the two together, we arrive at a normal cost per point. The results of these calculations are summarized on the cost sheet (Form 4, See page 14) and by extending the actual points produced by the difference between the actual and normal burden cost, the unearned burden or cost of idle equipment is ascertained. The productive pay roll is then tabulated on job cost sheets, the postings being made in points only, classified by operation numbers. At the close of a cost period, the points tabulated on these orders are multiplied by the total direct labor, and the normal burden cost per point, and material cost is added and the total is posted to the work in process account. The unearned burdens are carried direct to the Profit and Loss Account. Thus the actual as well as the normal cost per point is available. Either cost can be shown on the cost sheet. The excess cost due to idleness can be added as a separate item. We follow the first method as by that means we keep the excess cost out of inventories.

Estimating

By means of the sliding scales of standards referred to previously, the estimating department have complete information as to standards on all operations and with the cost sheet before them, they can figure the correct cost on any order by merely giving the standard the current cost value. The only estimating necessary occurs when an entirely new job which has not been done before is worked on. Even then the sliding scales provide information on similar work which can be used as a guide in setting the standard for the new work.

The cost sheets also form an excellent guide to the selling department as to what to sell. A comparison of the actual with the capacity points in each group shows plainly just the idle capacity you have on each operation and the selling department can make an effort to get the work required.

Planning

The standards adopted provide information for the establishment of a planning department. With a quantity of orders ahead

of an operation varying in size and style and therefore in speed of operation, it is difficult to tell just how far ahead the process is sold. With each order definitely rated in points (minutes) of production, however, it is easy to schedule work on different operations so as to prevent congestion of parts and delays in assembling. We have not as yet attacked this problem but we intend to do so.

Rate — Hour .24 / Point .004 / Premium .003 — Name Jane Doe — No. 540

Date 2/20/22 — Department 1

Order No	Op. No	Mch.	Name Customer and Operation	Hours	Piece	Std.	Points	Premium	Cost
9346	511	1	Brown & Co. Make Cover	35	2500	.1	250		
8462	511	1	Smith & Co. Make Cover	23	1700	.085	144		
9129	511	1	Jones & Co. Make Cover	32	1900	.11	209		
							603	241	
			Standard 60 Points ×	9	Hours		540		
			Premium Points				63		
			Premium Earned 13×.003				184		
			Total Pay 9 Hours × 24¢ = 2.16 + 1.84 =				$2.35		
			Credited to Pool				.06		
			Total				$2.41		

Form 1 - Time Sheet (Size 7¼ × 5¼)

Department 1 — Premium Posting Sheet — Week Ending 2/25/22

Clock No	Name	Item	Mon.	Tues.	Wed.	Thurs	Fri.	Sat.	Summary	Total Pay	
		Rate 24							Total Hours 40		
		Prem. Co.	603	609	570	510	570	240	Premium 11.76		
		Total Hours	67	67	65	56	63	25	Deductions		
		Average Premium							Net Amount		
540	Jane Doe		19	20	15	--	09	06	Premium 69	12	45

Form 2. Premium Posting Sheet (Size 14 × 15)

Dept "B" Fancy — Pay Roll Summary — Payroll

Prod. Cost per Point	.00429	497 09
N.P. " "	.00190	219 88
Total	.00619	716 97

Week Ending

	Date		Points	Amount	Manual	Remarks
Productive	No Prod. Employees					51%
	Point Hours		70			
	Hours Operations 1-18 (Incl 1+2 Ops)		1665.7			
	Points	Class 1 Std.	103011	44201		
		Class 2 & 3	6990	48.09		
		Total	116001	497.09	226963	
Allowed Points	1 Unequal standards		102	.45		
	2 Job changes				3.00	
	3 Bad stock, wait for stock		19	.09		
	4 Machine repairs		312	2.17		
	5 Sweeping and Cleaning		1350	7.60	10.00	
	6 Short stock					
	7 Repair bad work		2647	11.91		
	8 Relieving, Teaching, Help					
	9 Inventory					
	10 Misc			.08		
	11					
	Total		4429	22.29	13.00	
Non-Productive	20 Supervision		9282	58.11	130.00	
	21 Timekeepers		1978	10.10	15.00	
	22 Inspectors		11730	48.19	90.00	
	23 General work		7099	43.51	60.00	
	24 Machinist		4776	38.13	60.00	
	25 Assignments					
	Total		34966	198.04	353.00	
				.00162	Min. Cost + 19%	

Form 3. Pay Roll Summary
(Size 11 x 8½)

Cost Sheet — Factory "B"

1st. Period 4 Weeks Ending 1/28/22 — Dept. Fancy

Operation	Output Units	Normal Points	Allowed Points	% Eff.	Std. Cost per M	Actual Cost per Year	Standard Hours per M	Standard Hours per Year	Actual Hours per M	Actual Hours per Year	Average Hourly Rate per M	Average Hourly Rate per Year
501	116520	9860	5659	48	.0168		.0073		.0057		348	
502	479080	333530	261126	51	.0196		.0057		.0039		249.15	
503	94120	69389	41399	59	.0094		.0054		.0049		49.67	
504	269320	150125	121922	1.5	.0143		.0047		.0049		95.27	
505	115520	8260	11556	139	.0062		.0016		.0011			17.33
Total												

From Cost Stat. (Size 12½ x 9½)